предполагает операцию растворения оболочек ТВЭЛов в жидком цинке. В итоге, существует вероятность попадания цинка в технологические солевые электролиты, используемые на стадии электрорафинирования ОЯТ. Присутствие цинка может повлиять на коррозионную стойкость конструкционных материалов, поэтому основной целью настоящей работы являлось исследование влияния цинка на коррозионную стойкость конструкционных материалов в солевом расплаве $KCl–LiCl–UCl_3$.

В качестве конструкционного материала использовали ферритно-мартенситную сталь 16Х12МВСФБР(ЭП823). Коррозионные испытания проводили при 500 и 650 °С. Уран в расплав вводили в виде UCl_3, содержание урана в электролите составляло 1 мол. %. Исходное содержание цинка не превышало 0.2 мас. %.

По итогам испытаний, выяснили что присутствие цинка в солевом электролите привело к увеличению скорости коррозии образцов данной стали и изменению механизма коррозии. В присутствии цинка наблюдали развитие межкристаллитной коррозии, глубина проникновения после 100 ч контакта с расплавом при 650 °С составляла 50–60 мкм. Вдоль границ зерен было обнаружено значительное количество цинка, что указывает на его роль в качестве инициатора коррозии. Кроме того, металлический цинк выступает в качестве растворителя самой стали, что приводит к потере её коррозионной стойкости.

INSERTION OF SILICA INTO NANOPOROUS ALUMINA BY CHEMICAL DEPOSITION TECHNIQUE

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This paper presents an experimental consideration of the deposition of silicon dioxide in a nanoporous material. The matrix was filled in organic media containing tetraethoxysilane. The analysis of the obtained product on XRD, silica, was carried out using scanning electron microscopy in combination with EDX analysis. The characteristics of the filling of nanoporous materials by chemical precipitation from organic liquid media are considered. Electrophysical characteristics of the obtained composite were studied.

Anodic nanoporous self-ordered films, have received in recent years a wide range of applications, due to their capabilities in the field of manufacturing nanofibers, nanodotholes, nanotubes, membranes and coatings. Numerous studies have been carried out to obtain nanoporous ordered anodic films by electrochemical means [1,2]. However, within the framework of using these films as electrical insulating coatings, only the oxide layer of alumina turns out to be insufficient. In accordance with this, it is necessary to fill the porous space of the anodic oxide film of aluminum. CVD, ALD, electrophoretic deposition and chemical deposition can be used to fill such coatings [3].

Choosing the method of filling the anodic oxide, it is necessary to take into account that the material, after obtaining by the anodizing, is chemically active and rapidly dissolves in alkaline media. Based on these prerequisites, it is necessary to select an easily decomposable organic precursor to obtain silicon dioxide without contaminating the material with hard-to-remove impurities of precursors. For the synthesis, the most industrially available material was chosen, this is tetraethoxysilane(TEOS). The following composition was used: TEOS:H_2O (1:1) v/v, with the addition of HCl in an amount of 0.15%$_{mol}$, and $AlCl_3$ in catalytic amounts. After that, the sample was immersed in the organic phase, in which it was well wetted. Then the sample was heat treated at 170 °C, under vacuum, for depositing silica from the liquid phase into the solid phase with a nanoporous matrix, the filling result was analyzed using SEM-EDX analysis, which is shown in Fig.1.

Electrophysical characteristics of the obtained films are divided into two categories, before filling and after. Anodic nanoporous aluminum oxide without filling, with a thickness of 30 μm and an average pore diameter of about 80±10 nm, has the following characteristics, the breakdown voltage of 375±25V, the resistance at a constant voltage of 250V is about 10±1M. The presented method of filling allows improving these parameters. When the obtained filling with silica, the breakdown voltage on the coating thickness was 642±20V, the resistance at a constant voltage at 250V was about 15MΩ, at 500V about 4.0±0.5MΩ. It is shown that the filling of pores with dioxide can improve the electrophysical characteristics of a porous material made of alumina as an electrical insulator.

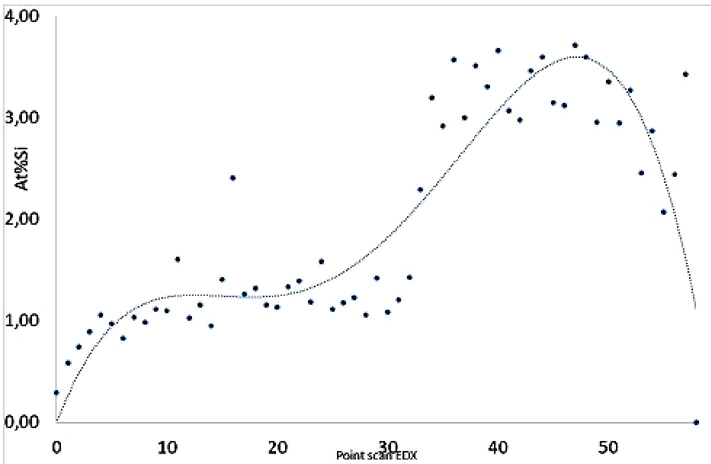

Fig. 1. Analysis of the filling of the matrix (thickness 30 μm each point 500 nm)

1. Yuferov Y.V., Arnautov A.I, et al., AIP Conf. Proc., 2015, 020113 (2018).
2. Sulka, G.D., et. al., Submicron Porous Materials, 107-156 (2017).